

What Is Claimed Is:

1. A transflective liquid crystal display, comprising:

gate and data lines crossing each other and defining a plurality of unit pixels, each unit pixel including a plurality of sub-pixel regions, each of the sub-pixel regions including a transmissive portion and a reflective portion, the transmissive portions gathered together within each unit pixel;

a thin film transistor in each sub-pixel region near a crossing of one of the gate and data lines adjacent to the sub-pixel region;

a passivation layer covering the thin film transistors and the gate and data lines, the passivation layer having openings that correspond to the transmissive portions in the unit pixels;

a reflector formed over the passivation layer in each sub-pixel region, the reflector corresponding in position to the reflective portion;

a pixel electrode in each sub-pixel region, the pixel electrode contacting the thin film transistor through a contact hole in the passivation layer.

2. The transflective liquid crystal display according to claim 1, wherein the unit pixel includes four thin film transistors disposed at different corners of the unit pixel.

3. The transflective liquid crystal display according to claim 2, wherein the transmissive portion in each sub-pixel region diametrically opposes the thin film transistor in the sub-pixel region.

4. The transflective liquid crystal display according to claim 1, wherein the thin film transistor includes a gate electrode extending from the gate line, an amorphous silicon active layer, a source electrode extending from the data line, and a drain electrode spaced apart from the source electrode across the gate electrode.

5. The transflective liquid crystal display according to claim 1, further comprising storage lines that are parallel with the gate lines and disposed between the sub-pixel regions.

6. The transflective liquid crystal display according to claim 5, wherein the storage line of each unit pixel has a crisscross pattern shape.

7. The transflective liquid crystal display according to claim 6, wherein the pixel electrode in each sub-pixel region overlaps the storage line and forms a storage capacitor.

8. The transflective liquid crystal display according to claim 1, wherein each thin film transistor includes a polycrystalline silicon layer, a gate electrode extending from the gate line over the polycrystalline silicon layer, a source electrode extending from the data line, and a drain electrode spaced apart from the source electrode across the source electrode.

9. The transflective liquid crystal display according to claim 8, further comprising storage lines that are parallel with the gate lines, wherein the storage lines are disposed between the sub-pixel regions in each unit pixel.

10. The transflective liquid crystal display according to claim 9, wherein each storage line has a crisscross pattern shape in the unit pixel.

11. The transflective liquid crystal display according to claim 10, further comprising a polysilicon pattern underneath the storage line in each sub-pixel region.

12. The transflective liquid crystal display according to claim 11, wherein the polysilicon pattern is shaped like a letter L and forms a storage capacitor with the storage line.

13. The transflective liquid crystal display according to claim 1, further comprising a color filter substrate that includes

a black matrix on a substrate, the black matrix corresponding to the thin film transistors and the gate and data lines;

a color filter layer on the substrate to cover the black matrix, the color filter layer having red, green and blue colors that corresponds to the sub-pixel regions; and

a common electrode on the color filter layer.

14. The transflective liquid crystal display according to claim 1, wherein two gate lines are disposed side by side and constitute twin gate lines.

15. The transflective liquid crystal display according to claim 1, wherein two data lines are disposed side by side and constitute twin data lines.

16. A method of forming an array substrate in a transfective liquid crystal display, the method comprising:

forming a plurality of gate lines, a plurality of storage lines, and a plurality of gate electrodes on a substrate;

forming a gate insulating layer on the substrate to cover the gate lines, the storage lines and the gate electrodes;

forming an active layer and an ohmic contact layer in series over each of the gate electrodes on the gate insulating layer;

forming a plurality of data lines, a plurality of source electrodes, and a plurality of drain electrodes over the gate insulating layer, each of the source and drain electrodes contacting the ohmic contact layer, the data lines perpendicularly crossing the gate lines to define unit pixels, each of the unit pixels including a plurality of sub-pixel regions, each sub-pixel region including a transmissive portion and a reflective portion, and the reflective portions of the sub-pixel regions gathered together in a center of each unit pixel;

forming a first passivation layer on the gate insulating layer to cover the data lines, the source electrodes and the drain electrodes, the first passivation layer including, in each unit pixel, a contact hole exposing a portion of the drain electrode and a first opening exposing the gate insulating layer in the transmissive portions;

forming reflectors within the reflective portions, each reflector corresponding to each sub-pixel region;

forming a second passivation layer on the first passivation layer to cover the reflectors, the second passivation layer having a second opening exposing the gate insulating layer in the transmissive portions;

forming pixel electrodes on the second passivation layer in the sub-pixel regions.

17. The method according to claim 16, wherein two of the gate lines are disposed side by side and form twin gate lines.

18. The method according to claim 17, wherein the storage lines are parallel with the gate lines and each storage line is disposed between adjacent twin gate lines.

19. The method according to claim 16, wherein two of the data lines are disposed side by side and form twin data lines.

20. The method according to claim 16, wherein the first passivation layer is an inorganic material selected from a group consisting of silicon nitride and silicon oxide.

21. The method according to claim 16, wherein the second passivation layer has a contact hole that exposes the portion of the drain electrode in each unit cell.

22. The method according to claim 17, wherein the pixel electrodes overlap portions of the gate, data and storage lines.

23. The method according to claim 22, wherein a portion of the storage line overlapped by the pixel electrode forms a storage capacitor corresponding to each sub-pixel region.

24. The method according to claim 16, wherein the unit pixel includes four thin film transistors disposed at different corners of the unit pixel.

25. The method according to claim 24, wherein the transmissive portion is disposed in an area opposite to the thin film transistor within each sub-pixel region.

26. The method according to claim 16, wherein each storage line is disposed between the sub-pixel regions.

27. The method according to claim 16, wherein each storage line has a crisscross pattern shape.

28. The method according to claim 27, wherein the pixel electrode overlaps the storage line and forms a L-shaped storage capacitor in each sub-pixel region.

29. A method of forming an array substrate in a transfective liquid crystal display, the method comprising:

defining a plurality of unit pixels in a substrate, each of the unit pixels including a plurality of sub-pixel regions, each sub-pixel region including a transmissive portion and a reflective portion, the reflective portions of the sub-pixel regions gathered together in a center of each unit pixel;

forming a buffer layer on the entire substrate;

forming a plurality of polycrystalline silicon layers and a plurality of polysilicon patterns, the polycrystalline silicon layers disposed near corners of the unit pixels, the polysilicon patterns disposed between the sub-pixel regions;

forming a gate insulating layer on the buffer layer to cover the polycrystalline silicon layers and the polysilicon patterns;

forming a plurality of gate lines, a plurality of storage lines, and a plurality of gate electrodes on the gate insulating layer;

forming a first passivation layer on the gate insulation layer to cover the gate lines, the storage lines and the gate electrodes, the first passivation layer and the gate insulating layers having contacts holes exposing portions of the polycrystalline silicon layers;

forming a plurality of data lines, a plurality of source electrodes, and a plurality of drain electrode on the first passivation layer, each of the source and drain electrodes contacting the polycrystalline silicon layer through the contact holes, the data lines perpendicularly crossing the gate lines to define the unit pixels;

forming second and third passivation layers in series on the first passivation layer to cover the data lines, the source electrodes and the drain electrodes, the second and third passivation layers including in each unit pixel a first contact hole exposing a portion of the drain electrode and a first opening exposing the first passivation layer in the transmissive portions;

forming reflectors within the reflective portions, each reflector corresponding to each sub-pixel region;

forming a fourth passivation layer on the third passivation layer to cover the reflectors, the second passivation layer in each unit pixel having a second contact hole exposing the portion of the drain electrode;

forming pixel electrodes on the fourth passivation layer in the sub-pixel regions, each pixel electrode contacting the drain electrode through the second contact hole.

30. The method according to claim 29, wherein two of the gate lines are disposed side by side and form twin gate lines.

31. The method according to claim 30, wherein the storage lines are parallel with the gate lines and each storage line is disposed between adjacent twin gate lines.

32. The method according to claim 29, wherein two of the data lines are disposed side by side and form twin data lines.

33. The method according to claim 29, wherein the third passivation layer is an inorganic material selected from a group consisting of silicon nitride and silicon oxide.

34. The method according to claim 29, wherein the pixel electrodes overlap portions of the gate, data and storage lines.

35. The method according to claim 34, wherein the portion of storage line overlapped by the pixel electrode forms a storage capacitor corresponding to each sub-pixel region.

36. The method according to claim 29, wherein the unit pixel includes four thin film transistors disposed at different corners of the unit pixel.

37. The method according to claim 36, wherein the transmissive portion is disposed in an area opposite to the thin film transistor within each sub-pixel region.
38. The method according to claim 29, wherein each storage line is disposed between the sub-pixel regions and overlaps the polysilicon patterns.
39. The method according to claim 29, wherein each storage line has a crisscross pattern shape.
40. The method according to claim 39, wherein each of the polysilicon patterns is shaped like a letter L.
41. The method according to claim 40, wherein the pixel electrode overlaps the storage line and forms a L-shaped storage capacitor in each sub-pixel region.
42. A method of forming a transflective liquid crystal display, the method comprising:
- forming gate and data lines that perpendicularly cross each other and define a plurality of unit pixels, each unit pixel including a plurality of sub-pixel regions, each sub-pixel region including a transmissive portions and a reflective portion, the transmissive portions gathered together within each unit pixel;
 - forming a thin film transistors in each sub-pixel region near a crossing of the gate and data lines;

forming a passivation layer to cover the thin film transistors and the gate and data lines, the passivation layer having an opening that corresponds to the transmissive portions in each unit pixel;

forming a reflector formed over the passivation layer in each sub-pixel region, the reflector corresponding in position to the reflective portion;

forming a pixel electrode in each sub-pixel region, the pixel electrode contacting the thin film transistor throughout a contact hole in the passivation layer.

43. The method according to claim 42, wherein the unit pixel includes four thin film transistors disposed at different corners of the unit pixel.

44. The method according to claim 43, wherein each transmissive portion is disposed in an area opposite to the thin film transistor within each sub-pixel region.

45. The method according to claim 42, wherein each thin film transistor includes a gate electrode extending from the gate lines, an amorphous silicon active layer, a source electrode extending from the data line, and a drain electrode spaced apart from the source electrode across the gate electrode.

46. The method according to claim 42, further comprising forming a storage line in each unit pixel that is parallel with the gate line, the storage line disposed between the sub-pixel regions.

47. The method according to claim 46, wherein each storage line has a crisscross pattern shape in the unit pixel.

48. The method according to claim 47, wherein the pixel electrode overlaps the storage line and forms a storage capacitor in each sub-pixel region.

49. The method according to claim 42, wherein each thin film transistor includes a polycrystalline silicon layer, a gate electrode extending from the gate line over the polycrystalline silicon layer, a source electrode extending from the data line, and a drain electrode spaced apart from the source electrode across the source electrode.

50. The method according to claim 49, further comprising forming a storage line in each unit pixel that is parallel with the gate lines, the storage line disposed between the sub-pixel regions and has a crisscross pattern shape.

51. The method according to claim 50, further comprising forming a polysilicon pattern underneath the storage line in each sub-pixel region.

52. The method according to claim 51, wherein each polysilicon pattern is shaped like a letter L and forms a storage capacitor with the storage line.

53. The method according to claim 42, further comprising forming a color filter substrate that includes:

a black matrix on a substrate, the black matrix corresponding to the thin film transistors and the gate and data lines;

a color filter layer on the substrate to cover the black matrix, the color filter layer having red, green and blue colors that corresponds to the sub-pixel regions; and

a common electrode on the color filter layer.

54. The method according to claim 42, wherein two gate lines are disposed side by side and constitute twin gate lines.

55. The method according to claim 42, wherein two data lines are disposed side by side and constitute twin data lines.

56. A transflective liquid crystal display, comprising first and second substrates having a liquid crystal layer disposed therebetween, the first substrate having gate and data lines defining unit pixels, each unit pixel including a plurality of sub-pixel regions, each of the sub-pixel regions including a reflective portion containing a reflector and a transmissive portion, adjacent pairs of the transmissive portions in different sub-pixel regions within each unit pixel arranged such that no reflective portion is disposed between the pair of transmissive portions, wherein the transmissive portion is devoid of the reflector.

57. The transflective liquid crystal display according to claim 56, wherein the transmissive portion and a thin film transistor in each sub-pixel region are arranged at opposite sides of the sub-pixel region.

58. The transflective liquid crystal display according to claim 56, further comprising storage lines parallel with the gate lines and traversing the unit pixels.

59. The transflective liquid crystal display according to claim 58, wherein the storage lines traverse centers of each unit pixel.

60. The transflective liquid crystal display according to claim 58, wherein the storage line of each sub-pixel region overlaps sides of the sub-pixel region.

61. The transflective liquid crystal display according to claim 59, wherein a region of overlap between the storage line and transmissive portion of each sub-pixel region forms an L shape.

62. The transflective liquid crystal display according to claim 58, further comprising a pixel electrode in each sub-pixel region that overlaps the storage line and forms a storage capacitor.

63. The transflective liquid crystal display according to claim 60, further comprising a polysilicon pattern underneath the storage line in each sub-pixel region and that forms a storage capacitor with the storage line.

63. The transflective liquid crystal display according to claim 61, further comprising a polysilicon pattern underneath the storage line in each sub-pixel region and that forms an L-shaped storage capacitor with the storage line.

64. The transflective liquid crystal display according to claim 56, wherein at least one of multiple gate lines and multiple data lines are disposed adjacent to each other between adjacent unit pixels.

65. The transflective liquid crystal display according to claim 56, wherein a thickness of the liquid crystal in the transmissive portions is about twice as large as a thickness of the liquid crystal in the reflective portions.

66. The transflective liquid crystal display according to claim 56, wherein the second substrate comprises:

- a black matrix corresponding to the gate and data lines and thin film transistors on the first substrate;

- a color filter layer that covers the black matrix and has red, green and blue colors; and
- a common electrode on the color filter layer.

67. The transflective liquid crystal display according to claim 66, wherein a single color covers all of the sub-pixel regions in a particular unit pixel and is different from the color covering at least some of the unit pixels adjacent to the particular unit pixel.

68. The transflective liquid crystal display according to claim 56, wherein the liquid crystal layer contains liquid crystal with a refractive index and thickness that provide substantially the same phase retardation value in the reflective and transmissive portions.

69. A transflective liquid crystal display, comprising first and second substrates having a liquid crystal layer disposed therebetween, the first substrate having gate and data lines defining unit pixels, each unit pixel including a plurality of sub-pixel regions, each of the sub-pixel regions including a transmissive portion, a reflective portion, a border area between the transmissive and reflective portions, a reflector and a passivation layer, the passivation layer and reflector disposed in the reflective portion and terminating in the border area before reaching the transmissive portion such that the border area contains a disclination of the passivation area and reflector that has a slope oblique to the first and second substrates, wherein the border area and reflective portion of at least one sub-pixel region in each unit pixel does not completely encircle the transmissive portion of the at least one sub-pixel region.

70. The transflective liquid crystal display according to claim 60, wherein the border area of each sub-pixel region does not completely encircle the transmissive portion of the sub-pixel region.

71. The transflective liquid crystal display according to claim 69, wherein the transmissive portions of the sub-pixel regions in each unit pixel are arranged at sides of the sub-pixel regions most proximate to a center of the unit pixel.

72. The transflective liquid crystal display according to claim 69, further comprising storage lines parallel with the gate lines and traversing the unit pixels.

73. The transflective liquid crystal display according to claim 72, wherein the storage lines traverse centers of each unit pixel.

74. The transflective liquid crystal display according to claim 72, wherein the storage line of each sub-pixel region overlaps sides of the sub-pixel region.

75. The transflective liquid crystal display according to claim 73, wherein a region of overlap between the storage line and transmissive portion of each sub-pixel region forms an L shape.

76. The transflective liquid crystal display according to claim 72, further comprising a pixel electrode in each sub-pixel region that overlaps the storage line and forms a storage capacitor.

77. The transflective liquid crystal display according to claim 75, further comprising a polysilicon pattern underneath the storage line in each sub-pixel region and that forms a storage capacitor with the storage line.

78. The transflective liquid crystal display according to claim 76, further comprising a polysilicon pattern underneath the storage line in each sub-pixel region and that forms an L-shaped storage capacitor with the storage line.

79. The transflective liquid crystal display according to claim 69, wherein at least one of multiple gate lines and multiple data lines are disposed adjacent to each other between adjacent unit pixels.

80. The transflective liquid crystal display according to claim 69, wherein a thickness of the liquid crystal in the transmissive portions is about twice as large as a thickness of the liquid crystal in the reflective portions.

81. The transflective liquid crystal display according to claim 69, wherein the second substrate comprises:

- a black matrix corresponding to the gate and data lines and thin film transistors on the first substrate;

- a color filter layer that covers the black matrix and has red, green and blue colors; and

- a common electrode on the color filter layer.

82. The transflective liquid crystal display according to claim 81, wherein a single color covers all of the sub-pixel regions in a particular unit pixel and is different from the color covering at least some of the unit pixels adjacent to the particular unit pixel.

83. The transflective liquid crystal display according to claim 69, wherein the liquid crystal layer contains liquid crystal with a refractive index and thickness that provide substantially the same phase retardation value in the reflective and transmissive portions.